



GPS Status and Modernization

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***Colonel Harold Martin
PNT Command Lead
AFSPC A3P***



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Overview

- GPS Overview
- Recent Events
- Modernization Improvements

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Critical Asset

- Vital to International Security, Economic Growth, and Public Safety
- Extends across all domains -- air, land, sea, space, cyberspace
- Effects transcend national and military boundaries



Available, reliable, accurate, and free of charge

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GPS – Serving the World

- Very robust constellation
 - 30 satellites currently in operation
 - 9 GPS IIA
 - 12 GPS IIR
 - 7 GPS IIR-M
 - 2 GPS IIF
 - 4 additional satellites in residual status
- Global GPS civil service performance commitment met continuously since December 1993
- GPS IIF-2 launched 16 Jul 11; set healthy 14 Oct 11
- Next Launch – IIF-3, Sep 2012



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GPS Control Segment



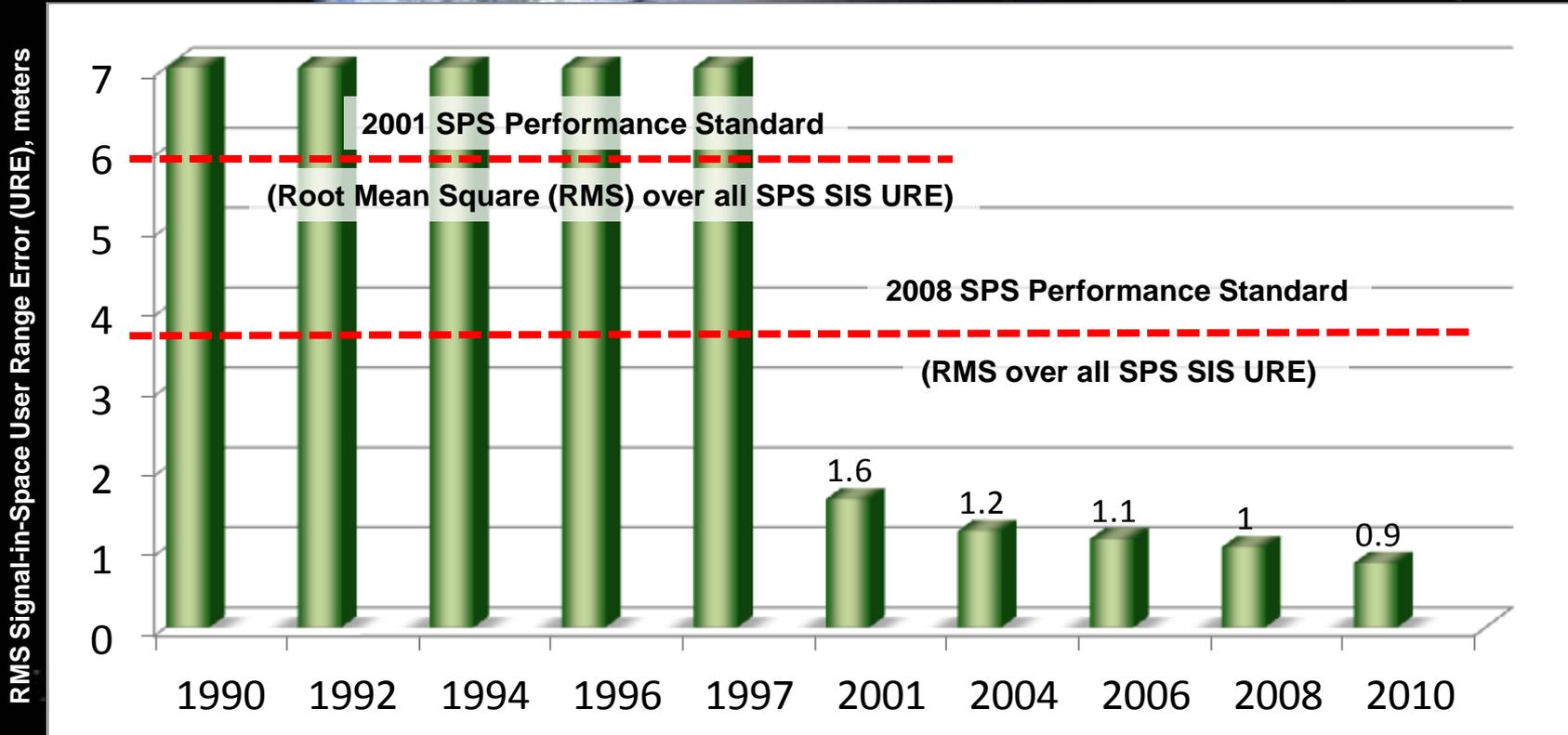
- Operated by Space Professionals in 2d Space Operations Squadron at Schriever AFB, CO
- Backup facility at Vandenberg AFB, CA
- Global monitoring and antenna networks





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SPS Signal in Space Performance



Selective Availability

System accuracy exceeds published standard

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GPS Modernization – Space and Control Segments

1995

2005

2010

2014 - 2025

GPS IIA

GPS II R / IIR-M

GPS IIF

GPS III



Space Segment

- Standard Service
- Single frequency (L1)
- Coarse acquisition code navigation
- Precise Service
 - Y-Code (L1Y & L2Y)

- IIA/IIR capabilities plus
- 2nd civil signal (L2C)
- M-Code (L1M & L2M)

- IIR-M capability plus
- 3rd civil signal (L5)
- 12 year design life

- Backward compatible
- 4th civil signal (L1C)
- Increased accuracy
- Increased integrity
- Increased AJ
- 15 yr design life

Control Segment

Legacy Control System

Architecture Evolution Plan (AEP)

Next Generation Operational Control System (OCX)

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GPS Modernization – Ground

- Architecture Evolution Plan (AEP)
 - Transitioned in 2007
 - Modern distributed system replaced 1970's mainframes
 - Increased capacity for monitoring of GPS signals
 - Increased worldwide commanding capability
 - Version 5.6 operational – Jan 11
 - Version 5.7 -- install complete 13 Oct 11, ops and IA fixes
- Next Generation Operational Control System (OCX)
 - Controls more capable GPS constellation
 - Monitors all GPS signals
 - \$1.5B contract awarded 25 February 2010
 - Preliminary Design Review—20-24 June 2011
 - MS-B: With Next AGER (9 Dec 11)

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UNCLASSIFIED/FOUO *GPS Modernization – New L2C Civil Signal*

- Second civil signal “L2C”
 - Designed to meet commercial needs
 - Higher accuracy through ionospheric signal distortion correction
 - 1st launch: Sep 2005 (GPS IIR-M); 24 satellites: ~2016
 - Codeless message currently broadcast from 7 IIR-Ms and 1 IIF
 - OCX Block 1 (2015)
 - Provides command, control, and monitoring of L2C
 - Enables new civil navigation message (CNAV)



GPS Modernization – New L5 and L1C Civil Signals

- Third civil signal “L5”
 - Designed to meet demanding requirements for transportation safety-of-life
 - 1st launch: 27 May 2010 (GPS IIF); 24 satellites: ~2018
 - Codeless message currently broadcast from IIF-1 and IIF-2
 - OCX Block 2 (2016) provides command, control, and monitoring of L5
- Fourth civil signal “L1C”
 - Designed with international partners for GNSS interoperability
 - Begins with GPS Block III
 - Nomenclature change
 - Change Increments A,B,C to SV 1-8 & SV09 & beyond (SV09+)
 - 1st launch: ~2014; 24 satellites: ~2021
 - OCX Block 2 (2016) provides command, control, and monitoring of L1C



GPS Modernization – Additional Secondary Payloads

- Distress Alerting Satellite System (DASS)
 - Current space-based Search and Rescue (SAR) systems take up to two hours to relay distress signals
 - DASS provides global bent-pipe capability to detect, locate, and relay distress alerts in near-real-time from emergency beacons interoperable GLONASS and GALILEO SAR systems
 - AFSPC/CC approved inclusion in next GPS III Space Segment CDD
 - DASS payload provided by Canada
 - Will be deployed on GPS III SV09+
 - Program Office working with DASS sponsors and Canadians on integration



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GPS Modernization – Additional Secondary Payloads

- Space Laser Ranging (SLR) Retroreflectors
 - Precise range measurement between SLR ground station and payload
 - Global international stations provide tracking data to improve geodetic reference frame
 - Improves orbit accuracy, GNSS interoperability, map accuracy, improved Earth modeling, ability to measure tectonic movement and ocean level changes
 - NASA, NGA, USNO, USGS, and NRL sponsors
 - Inclusion of payload in upcoming GPS III Space Segment CDD in work to gain AFSPC/CC approval
 - NASA agreed to provide SLRs and fund study
 - NGA agreed to fund SLR integration

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Summary

- Largest constellation in history with best accuracy ever
- Modernized Command and Control System allows more signal monitoring and quicker satellite commanding than ever before
- New secondary payloads benefit civil community
- And we're continuing to modernize and improve GPS even more!

GPS -- Serving the World

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